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# Online Health Communities as Social Spaces for Experimentation: Individual and Collective Epistemic Practices of Knowledge Co-production

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## ABSTRACT

Online health communities (OHC) are collectives of individuals that use Internet forums to share health-related information and empower patients to make informed health decisions. Like other online communities (OC), OHC are social spaces of knowledge production and innovation. By extending knowledge and innovation production beyond the traditional boundaries of expert organizations and professional practice, OHC can present epistemic dangers by challenging the epistemic authority of experts based on unsubstantiated knowledge claims. At the light of the benefits as well as potential dangers of knowledge peer-production in OHC, this study investigates the epistemic practices of a diabetes online community. Drawing on a virtue epistemology perspective, findings show that individual participants to this study and the community as a collective were motivated and capable of enacting virtuous epistemic practices. Yet, the study also demonstrated the ambivalence of apparently virtuous epistemic practices, which could have unintended consequences and conceal epistemic vices. This study contributes to the literature on knowledge co-production in OC within and beyond healthcare: first, it shows how individual

members of an OC can act as epistemic autonomous agents and behave in an epistemically safe and responsible way; second, it demonstrates the collective agency of an OC in facilitating epistemically responsible practices; third, it draws implications concerning the epistemic consequences of OC sites and their materiality; finally, it guides both patients and healthcare professionals on the epistemic practices patients should adopt when using OHC as a source of peer support and health self-management.

**Keywords:** Online communities, epistemologies, epistemic practices, knowledge, healthcare

## Introduction

Online health communities (OHC) are a collective of individuals that make use of Internet forums to share information about their medical condition and treatment (Bernardi 2016; Josefsson 2005). In these communities, patients find answers to the many questions about living with a chronic medical condition, which cannot be answered in a five-minute consultation with their healthcare professionals. Knowledge shared in OHC is a key source of community engagement and an important resource for health self-management and patient empowerment (Johnston et al. 2013; van Berkel et al. 2015). Like in other online communities (OC), knowledge creation and sharing are important social activities that sustain OHC (Faraj et al. 2016). Research on OC has mainly focused on peer-content production on web platforms such as Wikipedia (e.g. Arazy et al. 2016); sourcing of ideas from customers through user innovation communities (e.g. Blohm et al. 2016); temporary online crowds such as open innovation challenges (e.g. Majchrzak and Malhotra 2016); and open source software communities (e.g. Shaikh and Vaast 2016). Yet,

OHC represent a far less studied and understood type of OC as spaces for user-led production of knowledge that, traditionally, was of exclusive domain of scientific and professional experts.

The widespread use of social media and other Web 2.0 technologies has blurred the boundaries not only between production and consumption of knowledge, but also between expert and "non-expert" knowledge. Nowadays, Internet users are empowered through the co-production of knowledge tailored to their own needs and preferences. Therefore, digital technologies have extended knowledge and innovation production beyond the traditional boundaries of expert organisations (e.g. medical research institutes) and professional practice (e.g. clinical practice). By "decentring" the production of health knowledge from medical authorities to patients, OHC have the potential to transform healthcare by promoting healthy behaviours and producing patient-centred knowledge (Petrakaki et al. 2018). Nevertheless, peer production of knowledge can present "epistemic dangers" (Choo 2016b), in that it challenges the epistemic authority of experts based on unsubstantiated knowledge claims (Doty 2015). For example, a dilemma in healthcare is: how can we be reassured of the reliability of knowledge claims in OC, particularly in situations where these claims give rise to new healthcare management practices that have not been sanctioned by a medical institutional body? Understanding epistemic practices in these communities, i.e. how their members process and transform knowledge, is thus important because they affect the creation of new health management practices adopted within a patient population. In turn, these new practices can lead to tensions with institutionally accepted norms and practices of knowledge production in a scientific field. This can cause resistance from the scientific community to new forms of open innovation that put users at the centre of knowledge co-production. Scepticism is increased by the

spread of fake news and user-generated content whose denial of scientific discoveries can harm the advancement of science and, most of all, humanity and society as a whole (see examples of anti-vaccine (Doty 2015) and global warming OC (Vähämaa 2013)). Therefore, knowing how to differentiate between safe and unsafe epistemic practices in OC is important to encourage a pluralistic model of innovation in medical practice (Kirmayer 2012) and more widely in scientific research (Anonymous 2018). In the light of these considerations, this paper will address the following research question: *what are the individual and collective epistemic practices that support a virtuous production of knowledge and practice innovation in OHC?* This research draws on social epistemology and, more specifically, virtue epistemology (Baehr 2011; Zagzebski 1996) to understand to what extent OHC can act as epistemically virtuous agents, that is, agents who contribute, interpret, and evaluate knowledge in an "intellectually appropriate or rational way" (Baehr 2011) and who are motivated and have the ability to achieve justified true beliefs (Kornblith 1983). In other words, epistemically virtuous agents do not mislead and do not let others mislead them with false propositions. Specifically, this paper investigates the epistemic practices of members of a diabetes OC in the UK. This study will benefit patients and healthcare professionals with more knowledge about how OHC can be used responsibly as a useful source of health information and peer support. Implications from this research can also guide OC managers on the design of OHC that afford a balanced deliberation of contrasting views.

## Online Communities as spaces for innovation

OC are social spaces where collectives of individuals share information about common interests or concerns (Faraj et al. 2011). Recent research has advanced the

idea of OC as emerging forms of organising that drive knowledge production and innovation. Due to their fluid, dynamic, and open nature, OC facilitate knowledge contributions and the sharing of ideas from a multitude of members (Faraj et al. 2016). Yet, their same open and dynamic nature has attracted an emerging body of research interested in how OC can build and sustain the capacity of producing quality knowledge and delivering value to their members and other stakeholders (e.g. Barrett et al. 2016). For example, in a study about Wikipedia, Arazy et al. (2016) demonstrated how community mechanisms can have a stabilizing effect on the behaviour of individual emergent roles and, thereby, ensure quality and consistency in knowledge co-production. Majchrzak and Malhotra (2016) showed what type of knowledge-sharing trajectories and epistemic practices can generate innovative outcomes in a temporary online crowd. These studies increase our understanding of how fluid and continuously shaping forms of organizing in OC can ensure quality and innovativeness in knowledge production.

Similar research about OHC has mainly focused on how their users validate knowledge by navigating among the medical literature, healthcare professional advice, their own and their peers' lived experience (Kazmer et al. 2014). Other research has focused on the role of epistemologies, i.e. people's views about what knowledge is and how they come to know things about the world (Hofer and Pintrich 1997), in shaping people's understanding of knowledge and epistemic practices in these communities. In particular, research shows that patients' use of social media has led to the emergence of alternative epistemologies that are grounded in experiential knowledge, i.e. you know through intuition, anecdotal evidence, and personal experience with a disease (Broom and Tovey 2007), and subjective experience (e.g. being a mother) (Zaslow 2012). OC of patients thus place knowledge acquired

through socialization and shared experience above the epistemic authority of medical professionals (Whelan 2007).

Therefore, existing research offers a rich and varied account of how individuals view and experience knowledge shared in OHC for the management of their own health. Yet, less is known about the epistemic practices of single community members and OC as epistemic agents in generating and maintaining positive epistemic outcomes. The study presented in this paper is a first step towards enriching our understanding in this area. In particular, it will focus on: i. how individuals can distinguish the value and appropriateness of knowledge generated in OC to achieve their goals; and ii. how the community epistemic practices can maintain quality and consistency in knowledge production. Understanding these two issues is particularly important in the context of OC that produce lay knowledge to complement expert knowledge as in the case of OHC.

## Social epistemology and epistemic practices in online communities

Social epistemology builds on the notion that human knowledge is acquired socially from other people or secondary sources such as texts and books, and not through first-hand evidence (Doty 2015). A classical approach to social epistemology views social epistemic practices and institutions as means through which individuals form a "justified true belief" and their understanding of knowledge (Fallis 2006). That knowing is a social process is particularly evident on the Internet and even more so in OC, where people deliberate on information, scientific evidence, and news shared by others. The social nature of knowledge explains the difficulties in evaluating and establishing the authority of knowledge claims in OC.

Both individual users and the community as a collective are responsible for how community members form their understanding of knowledge shared online. On the one hand, research shows how members of OC get to believe whether or not a claim is true through individual claims of cognitive authority and by giving primacy to their first-hand experience over other sources of knowledge (Doty 2015). This is possible thanks to the personal nature of the Internet, which gives laypeople the means to exercise personal authority and to contest knowledge claims from mainstream media and public institutions. The contestation of others' authorities based on unsubstantiated knowledge claims contradicts social epistemology about the social nature of knowledge production.

On the other hand, due to their social and open nature, OC can have positive epistemic effects. Community members hold each other accountable for the information they share (Faraj et al. 2016), thereby affording constructive criticism and feedback to correct error and bias (Choo 2016a). Yet, the sociality of OC can also present epistemic risks. For example, research has shown how users of OC tend to trust information from members that share similar perspectives or values (Brady et al. 2016) and to form social network ties with people that share common social characteristics (Centola and van de Rijt 2015). Other studies have claimed that users who are active knowledge contributors and strongly identify with an OC value the stability of the community more than the attainment of truth (Vähämaa 2013). Therefore, the very social nature of OC might encourage individuals' propensity to deal with disagreement by defending and conforming to the beliefs of their social group rather than update their beliefs and achieve new learning (Choo 2016b).

This literature suggests the quality of knowledge exchanged in OC and the value that such knowledge generates depend on the motivation and capacity of its members

to act as intellectually virtuous agents both as individuals and as part of a collective. It will thus investigate the intellectual qualities of epistemic practices shared in a diabetes OC in order to assess their epistemic safety. In particular, it will investigate whether the selection, evaluation, and contribution of knowledge in this community is based on reasoned argument and justification.

## Virtue epistemology

Virtue epistemology studies the social production of knowledge based on the personal traits and qualities of epistemic agents rather than the justification of beliefs (Choo 2016c). In other words, virtue epistemology is more interested in the intellectual qualities and faculties of epistemic agents that motivate and guide epistemic enquiry, i.e. "an active and intentional search for the truth about some question" (Baehr 2011), than the actual practices that they adopt to evaluate and justify knowledge. The focus on agency is important because it calls the attention to the moral and intellectual obligations of epistemic agents given that what they decide to believe as true can have an impact on members of their community or social group (Code 1987).

According to Zagzebski (1996), an epistemic virtue has two elements: i. the motivation to achieve a desired goal; and ii. success in achieving that goal. The combination of these two elements is important to achieve an epistemically virtuous behaviour. For example, motivation of an epistemically virtuous agent goes beyond the desire for truth and involves a genuine cognitive effort to get in touch with reality in order to find the truth. Individuals that are only motivated by the desire for truth risk falling trap of intellectual dogmatism, an intellectual vice that induces an agent to hold strongly to his or her own beliefs despite evidence might warrant the contrary

(Choo 2016c). Likewise, the success component requires people to be open to new ideas, even when these ideas may contradict their own beliefs, showing the intellectual virtue of open-mindedness. It also requires individuals to be willing to defend their beliefs when they are under attack and when they have good reasons to believe that they are right, demonstrating intellectual courage.

The production of knowledge is a social process. Therefore, its justification occurs through social interaction (Longino 2001). In particular, Longino (2001) indicates that "critical discursive interaction" is a crucial social mechanism through which knowledge is justified and justified true beliefs formed. The importance of critical discursive interaction in knowledge evaluation and production is that it can encourage disagreement and dissent. Positive dissent and disagreement can offer competing views about a topic or issue. Multiple accounts are acknowledged and considered, and even though they might not lead to a solution or agreement, they offer a multiple perspective on the complexity and subtlety of a problem (Longino 2001). Critical discursive interactions are particularly important in the context of OHC since they can help members understand the complexity and uncertainty of medical knowledge.

## Research method

This paper draws on a research project about the epistemic practices of members of Diabetes.co.uk ongoing since June 2017. Diabetes.co.uk is a UK-based public forum whose membership counts over 600,000 members. The forum hosts patient-led discussions about alternative treatments of diabetes such as the low carb diet. In spite of the potential benefits of low carbing for Type 2 diabetes (Diabetes UK 2017), official clinical guidelines in the UK recommend a diet high in carbs. Therefore, the forum of Diabetes.co.uk is fertile ground for investigating how the OC and its users

act as epistemically virtuous agents while managing the contradictions between clinical advice and knowledge shared in the community. This research adopts qualitative data collection methods including one focus group of about 90 minutes with 7 forum members (held in June 2017), semi-structured interviews averaging 50 minutes with 45 forum members (collected between June and August 2017; June and July 2018; November and December 2018), and virtual ethnography (planned between January and June 2019). Details of participants whose data are reported in this paper are summarized in Table 1.

**Table 1**

**List of Participants**

| ID | Type of diabetes | Years/months with diabetes | Forum membership |
|---|---|---|---|
| P01 | T1 | 25 years | 8 years |
| P02 | None | N/A | 10 years |
| P03 | T2 | 4 years | 4 years |
| P04 | T2 | 12 years | 4 years |
| P05 | T1 | 41 years | N/A |
| P06 | T2 | N/A | 5 years |
| P07 | T2 | 7 years | N/A |
| P08 | T1 | 5 years | 4 years |
| P09 | T2 | 2 years | 2 years |
| P10 | T1 | 31 years | 2 years |
| P11 | T2 | 2 years | 2 years |
| P12 | T1 | 40 years | 2 years |
| P13 | T2 | 2 months | 2 months |
| P14 | T2 | 2 weeks | 2 weeks |
| P15 | None | 0 | 5 years |
| P16 | T1 | 25 years | 1 year |
| P17 | None | 0 | 2 years |
| P18 | T2 | 10 years | 4 years |

Since this is a research in progress, this paper illustrates findings from the focus group (P01-P07) and 11 interviews (P08-P18) during which participants were asked to comment about how they evaluated content shared in the community and their

knowledge contribution; and their experience with the community in helping a shared understanding and the production of user-generated content. Participants were recruited both through the forum and through a survey that asked participants to leave their contact if they wished to take part to the interview. The research has ethical approval from the University of Bristol. Both the focus group and interviews were digitally recorded, with participants' permission, transcribed and anonymised.

The analysis of data follows an inductive methodology to identify common instances of epistemic practices and their associated intellectual virtues and vices. Being open to the emergence of new themes, the coding process was guided by concepts from social epistemology and virtue epistemology and, in particular, the intellectual virtues and vices found in the literature.

## Findings

### Individual epistemic practices

*Initiate epistemic enquiry*

The majority of participants with T2 diabetes started searching for new information about diabetes soon after diagnosis and found the diabetes forum through an Internet search. Their motivation was to find answers to questions about the causes of diabetes, its complications, and how it can be treated. The majority of participants with T1 diabetes had lived with diabetes for several years. Therefore, they were more experienced about their condition. Their motivation for looking for information on the forum was mainly to find out about new medical innovations such as insulin pumps, people's experience with different types of insulin, and practical information on how to access dedicated national health services.

One epistemic virtue that motivated their search for information was **intellectual curiosity**. Intellectual curiosity is a key trait that motivates an agent to investigate a subject matter or issue that are significant (Baehr 2011). Intellectual curiosity is a natural inclination to learn more knowledge. Yet, for many study participants, intellectual curiosity did not reflect just a disinterested love for knowledge. Worry and concern motivated a person newly diagnosed with T2 diabetes to know more about what causes diabetes, its complications, and how to treat it. This participant with T2 diabetes said:

*"I started using the forum in October 2015. I was fairly sure I was about to be diagnosed with Type 2 diabetes. I'd been to the doctors about an unrelated issue and he said, "You should have a HbA1c test", which I probably had no idea what it was then, but then obviously I started to get a bit worried and thought I'd start to do some research on diabetes and the possible treatments for it" (P09).*

The majority of participants also felt that the support they were receiving from their medical professionals and the health service in general was either insufficient or inadequate. This is another reason why they felt the need for more information on how to manage diabetes and found in the forum the kind of support that they could not find anywhere else in the health service. **Intellectual courage**, namely, the willingness to consider alternatives that are contrary to popular beliefs (Montmarquet 1992), was another key quality that motivated several participants to explore alternative ideas in the management of diabetes that were not really in line with the standard advice from the national health service. For example, for T2 diabetes, many healthcare professionals would recommend a drug therapy accompanied with a diet high in carbohydrates. By contrast, many forum members shared success stories of

lowering their blood glucose in the normal range with a low-carb diet. These success stories were usually backed up with experiential evidence (for example, members record their blood glucose results in their profile signature) and scientific medical research. This evidence gave participants the confidence to know more about how diet can help them manage diabetes, as shown in this quote by a participant with T2 diabetes, even if it contravenes official medical advice:

*"On the [UK National Health Service] website, […] it doesn't really talk about low carbs, it didn't really explain to me that [diabetes] was caused by carbohydrates, […] and it didn't say to me, the first thing to do is to really look radically at your carbohydrates. I honestly thought all I had to do was stop eating sweets. […] What you won't find on there is anything about what I would consider, and radical might be the wrong word, but I would consider progressive things such as a low carb, high fat diet, a low protein, low fat diet, the Newcastle diet" (P13).*

*Evaluate other people's testimony*

In social epistemology "testimony from others" is the social act of exchanging knowledge between a speaker and a hearer (Choo 2016a). An important issue in social epistemology is how epistemic agents evaluate other people's testimony to justify a piece of information or evidence as "true" (Fallis 2006). Participants to this study evaluated knowledge on the online forum through three epistemic practices: i. the evaluation and selection of knowledge through embodied and emotional experience; ii. careful scrutiny and observation of evidence; and iii. the selection of evidence that confirms one's beliefs and desires.

The *evaluation and selection of knowledge based on embodied and emotional experience* concerns a) how people evaluate lived experience with diabetes by others;

and b) experiential learning, i.e. their own experience of experimenting with new ideas on how to manage diabetes. According to many participants, they needed to know whether and how a treatment or a new approach to managing diabetes had worked for other people before experimenting it on themselves. In an interview, a participant with T2 diabetes said:

*"Other people's experiences [give] you a huge insight in to what other people are doing, and I tend to pick and choose and experiment on myself quite a lot to see what works for me. If it works for me, then I carry on doing it; if it doesn't work for me, then I just try something else" (P09).*

This and other interviews revealed **open-mindedness**, **intellectual temperance (or sobriety)**, and **intellectual reflectiveness** as three important intellectual virtues that participants displayed in the evaluation of experiential evidence. Open-mindedness reflects one's attitude to be open to new ideas, even to ideas that contradict their beliefs or experience, as well as the "mental flexibility" that is required to evaluate various alternatives and arguments to address a problem (Baehr 2011). For example, a few participants with T2 diabetes said they chose which diet was best for them based on the reasoned evaluation of other forum members' experience. This approach also shows intellectual temperance, i.e. a moderate appetite for knowledge that guides our choices to consider new ideas worth of our attention because they have sufficient and reasonable supporting evidence (Battaly 2011; Montmarquet 1992). With reference to the example above, similarities across forum members' stories and their own experience with diabetes gave participants reason to believe in the usefulness of ideas and tips shared online. Finally, intellectual reflectiveness (Baehr 2011), i.e. the tendency to carefully reflect about one's own

experience and reasoned evidence, guided participants knowledge enquiry and informed their decision as to whether a new treatment or diet they were experimenting was good for them. For example, several participants with T2 diabetes monitored their blood glucose level regularly to assess whether they could control diabetes through diet. Yet, the reliance on experiential evidence can also present some epistemic risks. For example, it can induce us to consider stories of people that have similar traits as ours (e.g. age, personal background) and with whom we identify the most as suggested by this focus group participant with T2 diabetes:

*"There is almost always somebody there who's had, who's got the same thing as you are, [with whom you will share] a certain amount of commonality, and because of the huge population, there is always going to be people like me or people like you, or you, or you, or you that you can identify with" (P03).*

The tendency of listening to people we identify with can induce us to fall trap of **learning myopia** since it restricts our learning space to people that share commonalities with us, and, consequently, it reduces our chances to acquire new learning through argumentation, dissent, and critical discursive interactions (Levinthal and March 1993). This risk can be reduced through a *careful scrutiny and observation of evidence*, as experienced by several participants. In particular, participants mentioned various ways in which they validated knowledge from the forum. First, they checked for consistency between what someone stated to have done or achieved against their previous posts. In this way, they could build a profile and establish the credibility of that person. Second, they relied on "peer-validation", that is, they checked whether there was consensus about a post from other members. The activity of moderators and other members' comments helped someone decide whether the

advice given was sensible. Finally, the majority of participants cross-referenced what they were reading in the forum with scientific research available on the Internet. Others discussed the advice given in the forum with a medical professional. Those that had lived with diabetes for a long time also used their experience to judge whether a post was sensible.

These epistemic practices were guided by **intellectual autonomy**, **intellectual scrutiny,** and **intellectual consistency and objectivity**. Intellectual autonomy indicates that an agent is free and capable of choosing and forming independent opinions (Zagzebski 1996). For example, a participant with T2 diabetes explained how she formed her own independent opinion of how managing diabetes with alternative methods might be better than changing insulin:

*"Having been abroad for six months where I didn't have the option to change insulin, it was very useful to try other techniques which might have helped me. […] I have changed insulin before, and it's a very difficult process, so I'm not 100% convinced that changing my insulin is the way to go, so any other sort of options that I have, I'm willing to try. And that's where the forum has come in very useful because other people who have had similar problems have tried many different things and can say, you know, have you tried this, this works for me" (P16).*

Intellectual scrutiny is necessary to develop a "sufficient and appropriate focus" on the subtleties and details of a problem (Baehr 2011). For example, in this interview a participant with T2 diabetes explained how he cautiously verified the veracity of a statement by another forum member:

*"I have to be very careful because some people will say something and quite often I will think that does not sound right. So for example, only recently somebody said that*

*GPs [General Practitioners] have to pay a fine if a certain percentage of their patients weren't prescribed statins. Now that doesn't sound right, and it isn't right. What they actually meant was […] an incentive is made to a GP's surgery if at least 50 percent of his patients have cholesterol levels within a certain range. […] I'm very careful with everything I read and I will spend a lot of time double checking things" (P18).*

Finally, intellectual consistency and objectivity ensure that one evaluates information fairly and consistently by adopting good standards that guarantee an unbiased evaluation of information (Baehr 2011). Participants did not believe in what they were told in the forum straight away, but they consistently reviewed a piece of information against other evidence (e.g. the posting history and profile of posters, other members' posts, scientific evidence and, even though less frequently, medical professional advice). An example of how intellectual consistency and objectivity guided the evaluation of knowledge on the forum is offered by this focus group participant with T2 diabetes:

*"You've got to be able to filter the information that you receive through your own critical functions and you have to filter out some of the things that are just not credible. […] You can describe yourself as 'I'm 6ft 8inch' sort of thing, […] but nobody on there could say, 'No, that's not true.' But they may say, 'the consistency between other posts and things that he's made, actually doesn't make that a credible statement'" (P07).*

The majority of participants were self-motivated individuals with clear diabetes management goals. A common goal for participants with T2 diabetes, for example, was to manage diabetes through diet and without medication. Self-determination and

having clear goals to achieve can motivate epistemic enquiry. Yet, they can also induce an agent to focus their epistemic enquiry on evidence that confirms one's beliefs and desires, such as that managing T2 diabetes without medication is the only right way to go. An intellectual vice that reflects this attitude is **confirmation bias**, namely, the tendency to give preference to evidence that supports one's beliefs while discarding or refusing to collect evidence that goes against them. A tendency among some participants with T2 diabetes, for example, was to concentrate their epistemic enquiry on success stories and scientific evidence that proves the benefits of specific diets for the management of diabetes. They were less concerned to look for evidence that offered a less positive argument about the effectiveness of these diets. In the example that follows, one participant with T2 diabetes is clearly convinced of the effectiveness of low-carb diets based on the success stories of a multitude of forum members:

*"Everybody on their forum signatures has their history and numbers, so you can see when they were diagnosed, and how much they weighed, and what their diet was, and then you can see […] their low carb diets […] all of them chart their journeys in terms of their blood glucose meters and then they will say, "I'm in remission" or, "I'm off my meds" or, "I'm reducing my meds". […] So, yes, just in terms of empirical evidence there's loads, and […] it gets to the point where it's just really, really hard to deny that low carbing is the way to beat diabetes" (P14).*

Even though these stories are encouraging, a virtuous epistemic enquiry warrants the use of contrasting evidence to form an unbiased opinion.

*Express and manage dissent*

Another epistemic practice is peer-disagreement, whereby agents have the opportunity to critically engage in a discussion about contrasting views and opinions with their peers (e.g. members of an OC). Peer-disagreement is considered to lead to positive epistemic effects by stimulating learning and by providing individuals with the opportunity to review their beliefs based on a reasoned analysis of multiple perspectives about a complex problem (Choo 2016a). For peer-disagreement to happen, it is important that members of an OC express their own disagreement and respond to other members' contrasting views. In this respect, this study identified two epistemic practices: i. conflict avoidance by refraining from manifesting disagreement; and ii. express disagreement with reason and argument. Several participants interviewed gave evidence of the first practice. *Conflict avoidance by refraining from manifesting disagreement* can prevent peer-disagreement from happening and, therefore, is a missed learning opportunity for other members of the community. Nevertheless, it was an epistemic virtue – **intellectual humility** – that guided this practice. Intellectual humility is the tendency to recognize one's own knowledge and one's ability to acquire knowledge (Zagzebski 1996) and, in the specific context of this study, to express disagreement that encourages critical discussion. For example, one participant with T2 diabetes expressed disbelief at another forum members' suggestion to participate to a doughnuts challenge and see whose blood glucose goes up the most. He gave the following justification for not replying to this post in order to express disagreement:

*"I don't like conflict on the forum. People can misinterpret mails and things like that. I watched other people, who were perhaps more confident, have been on the forum longer, had got more wise counsel than me, reply. In a year's time, maybe, I will be*

*correcting people, but at the moment, I feel like I am still in the junior school, not in the post-grad school" (P13).*

Intellectual humility also guided the second epistemic practice, i.e. *expressing disagreement with reason and argument*, which, arguably, can be more successful in encouraging a healthy debate. An example of this practice is offered by this one participant with T2 diabetes and his response to community members complaining about their General Practitioner (GP) (the primary care doctor in the UK):

*"I always have to start with the sentence, 'I must be very lucky because my experience is different and this is what happened.' But I also emphasize - when people really moan about whatever's happened at the surgery and the hospital, I say, "Have you told them?" You're gaining nothing, […] unless you actually discuss […] with the people you're blaming for your issues" (P18).*

This participant was intellectually humble since he did not confront other forum members by telling them 'they were wrong' but expressed his disagreement by making them reflect on how they could improve a situation.

*Contributing knowledge*

Contributing knowledge is another important epistemic practice in an OC. Without the knowledge that community members share, positive epistemic effects such as increased learning would not materialize. Yet, for this knowledge to produce positive epistemic beliefs – for example, by preventing misinformation – community members need to be conscious of the limits of their own knowledge in general and, in the specific case of OHC, of the complexity of medical knowledge. In this respect, participants contributed knowledge through two main epistemic practices: i. assess one's expertise before giving an opinion; and ii. share experience without giving

advice. These practices were characterized by two intellectual virtues, **intellectual humility** and **intellectual caution.** Concerning the first practice, intellectual humility, as defined in the previous section, allowed participants to decide whether they could answer another member's query based on an honest assessment of their knowledge and experience. Intellectual humility also guided the second practice, i.e. *share experience without giving advice.* By recognizing the limits of their own knowledge and experience, participants did not advise other forum members on what they should do but let them form their own judgment based on their experience, as stated by this participant with T1 diabetes:

*"I would never say this is what you should do, I always put it from my personal point of view, so this is what has worked for me, for example or when I was a teenager this happened and I tried this, I wouldn't say I was giving direct advice just more telling my story or my side of things." (P16).*

This approach to sharing knowledge also entails intellectual caution about one's beliefs and what can be said in a given situation (Zagzebski 1996). Through intellectual caution, participants recognized that everyone is different, and what might work for them might not work for someone else, as explained by this participant with T1 diabetes:

*"I'm always very careful to put that they are my opinions, and if something affects me in a particular way then I'll say, "For me I need to do this, but everybody is different"(P12).*

The statement "everybody is different" shows critical understanding about the complexity of medical knowledge. This is a virtuous epistemic quality: it helps forum members not to dismiss an argument or idea because it does not give expected results,

but encourages them to continue their epistemic enquiry to satisfy their appetite for knowledge.

**Collective epistemic practices**

*Guide epistemic enquiry*

Having analysed the epistemic practices of individual forum members, central to this paper is also to investigate collective epistemic practices in OC and how they can encourage a virtuous epistemic enquiry. A first practice is *encouraging and guiding independent epistemic enquiry*, as shown in the example given by a participant with T2 diabetes:

*"Somebody who was a newbie to low carb high fat […] said that they liked carrots but they noticed it was off the list. […] So the general responses were, "Eat to your meter". […] That means take your blood sugars before and test. So have a meal that you would know wouldn't give you high blood sugars, test, then the next day, have the same meal, add the carrots in and see what results you get. If you don't get a spike [in your blood sugars],… then that's right for you" (P11).*

In this example, forum members did not told the enquirer whether or not to eat carrots, but gave some practical advice that the enquirer could use to collect enough evidence to make an independent informed decision. This and other examples show how forum members can foster **intellectual autonomy** among their peers by encouraging them to form independent epistemic judgments about information shared on the forum.

Another way in which forum members encourage independent epistemic enquiry and foster **intellectual autonomy** is by *sharing personal stories about their experience with diabetes*. As the discussion about individual epistemic practices has

shown, forum members that contribute knowledge to the forum tend not to be prescriptive and refrain from giving instructions of what others should do. It is up to members of the forum to draw lessons on how to manage their own diabetes from other people's experience. In addition, forum members are generally concerned about the impact that their posts can have on other members' life. For the most part, the tendency is not to misinform or harm people, as suggested by a focus group participant with Type 2 diabetes, who's also a moderator of the forum:

*"With something like diabetes, people who've experienced the diagnosis and all that, [and] who've had that shocking experience, very few are going to say, 'Oh forget it, you'll be fine, keep digging into those Jammie Dodgers [Ed. a popular British biscuit], you'll be fine, don't worry about that'. Most people are concerned for them because they remember how it felt" (P03).*

The majority of people on the forum have the common goal to manage their diabetes. They do not have an interest in harming other members by providing false and misleading information. Such sensitivity about their knowledge contribution reflects the **intellectual integrity** (Baehr 2011) that drives epistemic practices in the community.

One last collective epistemic practice that encourages independent epistemic enquiry is to *build focus on the details of a problem*. Such practice reflects the epistemic virtue of **intellectual scrutiny**, since it develops a "sufficient and appropriate focus" on the subtleties and details of a problem (Baehr 2011). In this regard, a participant with T1 diabetes said:

*"What you tend to find is that when people post on a subject, […] if somebody gives positive advice and it's suitable for that person, […] people will reconfirm that in*

*further responses on the forum. So […] there's a consensus […] that the advice given has been beneficial and is positive for that person. […]" (P08).*

*Manage peer-disagreement*

Earlier it was discussed how individual participants expressed and managed disagreement. The focus of this section is on peer-disagreement by the community as a collective agent. Three main practices for managing peer-disagreement were identified: i. build collective agreement and consensus; ii. discipline epistemic intemperance and hubris; and iii. moderate knowledge contribution.

*Building collective agreement and consensus* is about resolving rather than cultivating peer-disagreement. A key mechanism to achieve consensus is through material features inbuilt in the forum site such as "likes" or other emoticons to express agreement with an idea or position. Earlier, I discussed the response of one participant to other members complaining about their physician. At the question about the reaction to his post from other members of the forum, he replied:

*"It kind of goes a bit quiet. You get several people who suddenly agree with you, but again the perpetrator, as it were, doesn't really say an awful lot, because I think sometimes they realize, 'yeah, he's probably right, but I'm not going to admit to it'" (P18).*

This evidence suggests that peer-agreement mechanisms embedded in online platforms can lead participants to relinquish their own ideas and beliefs and adhere to the ideas and beliefs of the majority. This conformist tendency can nullify the positive epistemic effects of peer-disagreement, by silencing dissent and, therefore, inducing the risk of **epistemic injustice** (Fricker 2007). Thus, an agent might feel intimidated

to provide a reasoned justification of beliefs and actions that contradict the beliefs held by the majority of community members.

Another practice related to peer-disagreement is to *discipline epistemic intemperance and hubris*. As opposed to the epistemic virtue of intellectual temperance, epistemic intemperance is the vice of the "enthusiast" who has appetite for new and unfamiliar ideas that do not have sufficient supporting evidence to warrant epistemic enquiry and justify a true belief (Montmarquet 1992). Epistemic hubris, the opposite of intellectual humility, reflects an agent's overconfidence in one's knowledge, credibility, and expertise, and one's presumption of being above knowledge. According to participants, if someone's posts reflect any of these intellectual vices, forum members are quick in putting them right as shown by the following response to the member that launched a doughnut challenge:

*"That is just one example of many I have seen where the advice has just been wrong. However, I would also add there is a lot of correction that goes on, so when people do post things that are wrong, then you get quite a flurry of people who say, 'That is not right, that is not right.' so, it is almost self-moderating" (P13).*

Inviting a person with diabetes to take part in a "doughnut" challenge is not only morally wrong but also epistemically wrong since it can induce someone to believe that they can eat as many doughnuts as they want and still be fine. This is untrue. Hence, in this example, forum members demonstrated **intellectual courage,** that is, they had good reasons to believe they were right and had the right confidence and ability to achieve the truth by correcting an epistemically wrong and dangerous statement (Montmarquet 1992).

*Peer-moderation of knowledge contribution* is another practice through which forum members manage peer-disagreement as reported in the focus group and the interviews. In this regard, a focus group participant with T2 diabetes gave an account of how peer-moderation is practiced in the forum:

*"It's the bulk of the members, it's the moderators, it's the rules on the forum, but it's also the rest of the responsible members, because somebody comes on and says, 'No, Jammie Dodgers are ace, you can live on them, I just inject insulin for it.' And you get a whole host of Type 1s saying, 'Yes, you may be able to inject insulin for it, but it's not a balanced diet, is it?'"(P6).*

In the spirit of "critical discursive interaction", the management of disagreement in an epistemically virtuous way should not compel people to agree with an idea, but should help them base their judgment on reason and argument (Longino 2001). Likewise, in this example, forum members *encouraged critical discourse and reflection* through reason and argument. They did not say 'you are wrong!' or 'you are going to kill yourself!'. They simply put the other forum member in front of the reasoned argument that what he was suggesting was not a balanced healthy behaviour and left this individual decide what to do next. In this example, the forum response to peer-disagreement encouraged the speaker to reflect critically upon his or her own experience in line with the epistemic virtue of **intellectual reflectiveness**.

Peer-moderation through "critical discursive interaction" also has the epistemic benefit of ensuring **intellectual consistency and objectivity** since it can correct and validate information. A participant with T1 diabetes gave the example of one forum member correcting a post that was wrongly stating that berries were high in potassium. The participant used this example to prove his point about the ability of

forum members to correct and ensure the validity of information, shared on the forum:

*"There is a danger that if you take the first response and walk away, you may get incorrect information, but if you allow the threads to persist for a short while, any incorrect information is always corrected, so I think it's almost always valid information and useful information" (P10).*

## Discussion

This study casts light on the epistemic practices of members of an OC both as individuals and as members of a collective. Given the limited research about the mechanisms through which OC can sustain quality knowledge production (Arazy et al. 2016), this study provides a unique insight into the implications of epistemic practices of OC in maintaining positive epistemic outcomes, such as the production of quality knowledge, safe information, and innovative practices. In particular, findings from the diabetes OC identified key epistemic practices that individual members took in justifying knowledge. They also offered insights into the collective epistemic practices that the OC enacted to facilitate a virtuous epistemic enquiry by its members.

Drawing on a virtue epistemology perspective, findings showed that individual participants to this study and the community as a collective were motivated to and capable of enacting virtuous epistemic practices. These practices allowed individuals to distinguish the value and appropriateness of knowledge in OC to achieve their goals and were crucial for maintaining quality and consistency of knowledge production within the community. A summary of these practices and their intellectual virtues as well as vices is provided in Tables 2 and 3.

**TABLE 2**

**A Summary of Individual Epistemic Practices of the OC Members and their Associated Intellectual Virtues and Epistemic Vices**

| Category of individual epistemic practices | Type of individual epistemic practices | Intellectual virtues | Epistemic vices |
|---|---|---|---|
| Initiate epistemic enquiry | • Search for information about diabetes online and in the forum | • Intellectual curiosity<br>• Intellectual courage | - |
| Evaluate other people's testimony | • Evaluation and selection of knowledge based on embodied and emotional experience | • Open mindedness<br>• Intellectual temperance<br>• Intellectual reflectiveness | • Learning myopia |
| | • Careful scrutiny and observation of evidence | • Intellectual autonomy<br>• Intellectual scrutiny<br>• Intellectual consistency and objectivity | • Confirmation bias |
| Express and manage dissent | • Conflict avoidance by refraining from manifesting disagreement<br>• Express disagreement with reason and argument | • Intellectual humility | - |
| Contribute knowledge | • Assess one's expertise before giving an opinion | • Intellectual humility | - |
| | • Share experience without giving advice | • Intellectual caution | |

**TABLE 3**

**A Summary of Collective Epistemic Practices of the OC and their Associated Intellectual Virtues and Epistemic Vices**

| Category of collective epistemic practices | Types of collective epistemic practices | Intellectual virtues | Epistemic vices |
|---|---|---|---|
| Guide epistemic enquiry | • Encourage and guide independent epistemic enquiry<br>• Share personal stories about experience with diabetes<br>• Build focus on details of a problem | • Intellectual autonomy<br>• Intellectual integrity<br>• Intellectual scrutiny | - |
| Manage peer-disagreement | • Build collective agreement and consensus<br>• Discipline epistemic intemperance and hubris<br>• Moderate knowledge contribution<br>• Encourage critical discourse and reflection | -<br>• Intellectual courage<br>• Intellectual reflectiveness<br>• Intellectual consistency and objectivity | • Epistemic injustice |

Experiential evidence and knowledge played a crucial part in guiding the epistemic enquiry of participants. This form of enquiry allowed participants to be open to other people's experiences (open-mindedness); have confidence in testing new ideas (intellectual courage); make sure that evidence about new approaches to

managing diabetes was reliable (intellectual temperance and scrutiny); have the intellectual humility to recognize the limitations of their own knowledge and medical knowledge in general. This encouraged other members of the community to evaluate knowledge based on reasoned argument and justification and by reflecting about the experimentation of new ideas (intellectual reflectiveness).

The epistemic agency of the community was also crucial in encouraging epistemically virtuous behaviours. It fostered the intellectual autonomy of its members by encouraging them to form independent epistemic judgments about information shared on the forum. It maintained intellectual integrity in making sure that knowledge contribution was not harmful or misleading. It showed intellectual courage in disciplining the epistemic intemperance and hubris of members that made inappropriate and epistemically dangerous knowledge contributions. Through critical discursive interactions, it did not force members to agree with a particular idea, but encouraged them to form their own independent judgment through reason and argument (intellectual reflectiveness).

Yet, the study demonstrated the ambivalence of epistemic practices, that is, epistemic practices that are well intentioned and have apparent positive epistemic effects can also have unintended consequences and conceal intellectual vices. For example, findings suggest that reliance on experiential evidence could limit the focus of community members' epistemic enquiry on stories from people with whom they shared similar traits and identified the most (learning myopia). Desires and goals that guide an epistemic enquiry could also conceal the trap of confirmation bias by focusing members' attention on evidence that confirmed their beliefs. Finally, intellectual humility could wrongly induce community members to avoid conflict and the potential positive learning effects of peer-disagreement. Likewise, peer-agreement

mechanisms of OC (e.g. likes) could conceal the risk of epistemic injustice because, inadvertently, they could intimidate an individual to justify beliefs and actions that contradict the views held by the majority of members.

## Implications

This study contributes to the literature on the implications of OC and, more specifically, OHC in knowledge co-production. Latest research has focused on OC as monolithic entities by focusing on how social and structural mechanisms influence knowledge contribution (e.g. Ma and Agarwal 2007) and social interactions (e.g. Aral and Walker 2014). This study helps shed light onto the practices of individual community members together with their desires, goals, and emotions. Even though it is undeniable that individual members of OC have common epistemic goals and emotions that drive their epistemic enquiry, it is important to recognize them as epistemic autonomous agents to fully appreciate the extent to which they are engaging with OC in an epistemically safe and responsible way. Taking homophily as an example, research has shown that social network sites and OC can reinforce the tendency of forming strong social ties with people that share common traits (e.g. age, ethnicity, attitudes, beliefs) (Centola and van de Rijt 2015). Strong ties with like-minded people present the risk of confirmation bias since they reduce opportunities to critically evaluate online content by contrasting opposed views (Matthews and Stephens 2010). Even though this study has confirmed the risk of this bias, it has also demonstrated the complexity of community members' epistemic practices and their motivation and ability to pursue a virtuous epistemic enquiry.

The collective epistemic agency of the community has not been properly understood either given the focus of most studies on organizational mechanisms, such

as roles (Arazy et al. 2016), and social exchange mechanisms (Faraj and Johnson 2011; Huysman and Wulf 2006), such as reciprocity. Through a virtue epistemology perspective, this study increases the understanding of OC as epistemically and, consequently, socially responsible actors in the production of information and knowledge that is not harmful. In particular, a community to be epistemically responsible has to encourage critical discursive interactions. Future research could consider the role of influencers and authority in OC in influencing such interactions. By combining a structural with an agency-focused approach, future research could also investigate social capital mechanisms (e.g. identification, reciprocity) in influencing critical discursive interactions.

A further implication of this study concerns the epistemic consequences of Internet technologies (Miller and Record 2013) and, more specifically OC sites. Past research shows that material features that are unique to these sites (e.g. user ID, number of likes) mediate social mechanisms that attract knowledge contribution, such as identity verification (Ma and Agarwal 2007) and social status (Levina and Arriaga 2014). This study has demonstrated the potential of peer-agreement mechanisms to lead to epistemic injustice. This is not to say that OC sites have negative epistemic consequences, but this finding problematizes the material agency of OC sites in influencing our capacity to act as responsible epistemic agents in forming justified true beliefs.

A second set of implications from this study concerns OHC as a source of innovation in health management practices and medical knowledge. Research in this area has mainly focused on the dangers that experiential knowledge and anecdotal evidence pose to medical expertise and science (e.g. Whelan 2007). Findings in this study provides complement existing research by showing how experiential knowledge

gains a higher position in the hierarchy of knowledge not in competition with but as a means to test medical research and clinical advice. Experiential knowledge shared in OHC constitutes an engine of innovation, whereby patients can experiment new health management practices that have not yet gained legitimacy in institutionalised clinical practices and guidelines. Most of all, as shown in this study, experiential knowledge and evidence can play a crucial part in encouraging a set of intellectual virtues that ensure safe epistemic practices, innovation, and knowledge quality, such as open- mindedness, consistency, and objectivity.

Furthermore, this study highlights the importance of community members' goals and motivations in driving epistemic enquiry. Participation to the diabetes OC did not lead to a change of heart concerning diabetes management. Instead, it confirmed participants' initial health and treatment beliefs (e.g. treating diabetes with less medication). The risk of confirmation bias influencing OHC members' epistemic enquiry is possible. Yet, the evidence presented in this paper is limited and more research concerning this risk is needed. Finally, whereas previous research has mainly focused on individual epistemic practices in OHC (Hanell and Salö 2015), this study demonstrates the implications of collective epistemic practices of OHC in encouraging intellectual autonomy and independent enquiry. These practices can have positive therapeutic effects in supporting patients' informed choice about their own health.

This study also has implications for practice. First, it shows patients that are new to OHC the right attitudes and intellectual virtues in the search and evaluation of information. It also shows the value of experiential knowledge in experimenting new approaches to the management of a chronic condition with open-mindedness, intellectual autonomy as well as caution. In this respect, it warns patients against

believing claims that cannot be proven through experimentation and that can constitute a threat to public health. An example is claims about the relationship between vaccines and autism in anti-vaccination OC. Second, findings from this research can advise healthcare professionals on the epistemic practices that they should recommend to their patients in order to navigate OHC safely. It also shows that, when guided by intellectual virtues, experiential epistemic enquiry in OHC is a source of experimentation with new medical research that does not yet have a place in clinical practice. In this sense, OHC can be seen as engines of innovation in clinical practice. Finally, findings from this research have implications for managers of OC. In particularly, it shows the value of designing community features that encourage peer-disagreement and constructive critical discourse.

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